

# INTRODUCTION OF BARLEY & OTHER NATIVE CROP MUTANT CULTIVARS

(PER/5/024) D2 New

## MODEL PROJECT

### CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US \$	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1997	1/19	21,560	0	41,000	10/0	31,500	0/0	0	17,600	24,000	0	135,660
1998	1/5	16,275	0	84,000	14/0	46,200	0/0	0	0	24,000	0	170,475
1999	1/19	24,010	0	33,300	15/0	51,750	0/0	0	19,600	24,000	0	152,660
2000	0/21	10,815	0	25,000	0/0	0	0/21	7,980	0	24,000	0	67,795
2001	0/28	15,120	0	10,000	0/0	0	0/0	0	111,780	24,000	0	160,900

First Year Approved: 1997

**OBJECTIVES:** This project's development goal is to increase food supply and farm income in the Andean Highlands of Peru through breeding and selection of improved crop lines, and their widespread cultivation. The immediate objectives of the project are: 1) to develop sufficient seed production capacity to support the widespread cultivation of new barley and other crop lines in the Andean highlands; 2) to promote increased awareness among farmers of the improved lines, initially focusing on the mutant barley, UNA La Molina 95; 3) to stimulate cultivation of the new barley line on 20-40 kha; and 4) to upgrade plant breeding capability in the Cereals Program at La Molina University leading to continued development of improved barley, quinoa, and kiwicha lines more rapidly and with greater cost effectiveness.

**BACKGROUND:** Barley is the third most important cereal crop in Peru. Of the total 130 kg harvested annually, 80% is grown in the highlands at altitudes around and above 3000 m. Barley provides more than 20% of the total caloric intake of the 7 million inhabitants of the region. Peruvian plant breeders developed a semi-dwarf, naked mutant variety, UNA La Molina 95, under TC project PER/5/021, using radiation induced mutation. It is drought and frost resistant, has high nutritional value, matures early, and provides yields 1.5 - 2 times greater than lines currently planted, even under the harsh conditions and unsophisticated agronomic practices in the highlands. Because it is naked (lacks a hull), processing for local consumption is easy. The challenges now are to produce seed in sufficient quantities to support widespread cultivation, and to increase farmers' awareness and acceptance of the new line. The ancient Inca crops quinoa and kiwicha are nutritionally rich and highly adapted to conditions in the highlands (quinoa) and sierra (kiwicha). However, partly because they have been under cultivation for so long, their gene pools have become restricted. Radiation mutation can enlarge the pools and, in concert with new plant breeding technology such as anther cell culture, speed the development of improved lines. Quinoa tends to grow too tall, while kiwicha seeds are too small for convenient handling. Radiation mutation can create the basis for de-selecting these characteristics, while preserving hardness and nutritional value. The Cereals Program at La Molina Agricultural University has an excellent record of producing and extending improved crop lines. All the cereal crops grown commercially in Peru today resulted from the efforts of the University's plant breeding team. The Government recently contracted with them to produce sufficient barley seed to meet the needs of the more than 300,000 people now resettling their farms in the highlands as peace and stability return to the region.

**PROJECT PLAN:** The principal project activities will consist of seed production and distribution; production of promotional materials; and operation of demonstration plots in nine separate highlands locations. In addition, breeding and selection will continue to sustain the availability of disease-resistant crop lines with high yield and nutritional value, as well as desirable grain characteristics. Staff training in state-of-art plant breeding technologies, including radiation-induced mutation, will support this effort. Project outputs will include 1-ha demonstration plots in nine highland farming areas. A large national agricultural firm, Backus Corporation, will operate several of the plots in five locations, and also support seed production. The remainder of the plots will operate under subcontracts let to the National Agricultural Foundation. Promotional materials and activities, also produced under subcontract, will enhance the extension effort. To reach the goal of extending the new barley line to 20 - 40 kha by year 2000 will require the production of around 200 - 400 t of seed annually. Upgraded plant breeding facilities and staff trained in new methods, principally the doubled haploid technique, will reduce the time required to develop new lines of barley, quinoa and kiwicha.

**NATIONAL COMMITMENT:** The plant breeding team at the University La Molina is headed by a respected scientist who is familiar with conditions in the highlands. The team consists of several junior professionals and technicians, most of whom have both laboratory and field experience. The facilities available to the team include laboratories, greenhouses, germplasm storage facilities, and experimental plots and implements in the highlands. The Cereals Program also has access to more than 200 ha of land at experiment stations in the lowlands, along

with most of the agricultural equipment needed for large-scale seed production. The Government underwrites annual operating costs of about 200,000 soles, and the Backus Corporation provides additional assistance with logistics. Recently, the Government announced that it would include distribution of UNA La Molina 95 barley seed in its program to resettle people onto the farms they fled because of earlier terrorist activity. This decision resulted in the planting this year of sufficient barley to yield 400 t from seed production plots in the lowlands. The Government will purchase this seed from the University and take charge of its distribution.

**AGENCY INPUT:** The Agency will assist the plant breeding effort through provision of expert services; specialized training in subjects including grain nutrient quality, mutant selection, double haploid production, and genetic analysis; and limited laboratory equipment, radiochemicals, and supplies. It will also support extension work through the organization of workshops; subcontracts for operation of demonstration plots and the production of promotional materials; and small-scale equipment acquisition, including devices for seed cleaning and classification, and for precision harvesting of demonstration plots.

**PROJECT IMPACT:** Impact from the project will be felt by the time of the 1997 harvest, when the mutant barley's improved yield will result in increased production of up to 40 kha. The combined effects of demonstration plots in the cultivation areas, farmers days, and dissemination of promotional materials by print and broadcast media, should lead to wider cultivation in the future. To support the planting of increased acreage, seed will be set aside from the initial harvest, while the Government continues in subsequent years to contract with the University for additional seed production. This arrangement will contribute to the continuation of the plant breeding efforts by putting them on a self-sustaining financial basis. Food security and adequate nutrition are both pressing issues in the highlands, where growing conditions are marginal, and transportation costs to and from the lowlands mean a multiple increase in food import costs over market prices on the coast. A successful extension effort with barley can serve as a model for other crops. These same circumstances exist in other Andean countries, particularly Bolivia. The lessons learned through this national project may therefore be of considerable regional significance. The plant breeding team will be strengthened through training in recent technologies, which will also contribute to cost-effective production of new lines of other Andean cereals, such as quinoa and kiwicha. Successful extension of the new barley will encourage similar efforts with these other important food sources.